Missing orographic drag leads to climate model biases in jet streams, blocking and storm tracks

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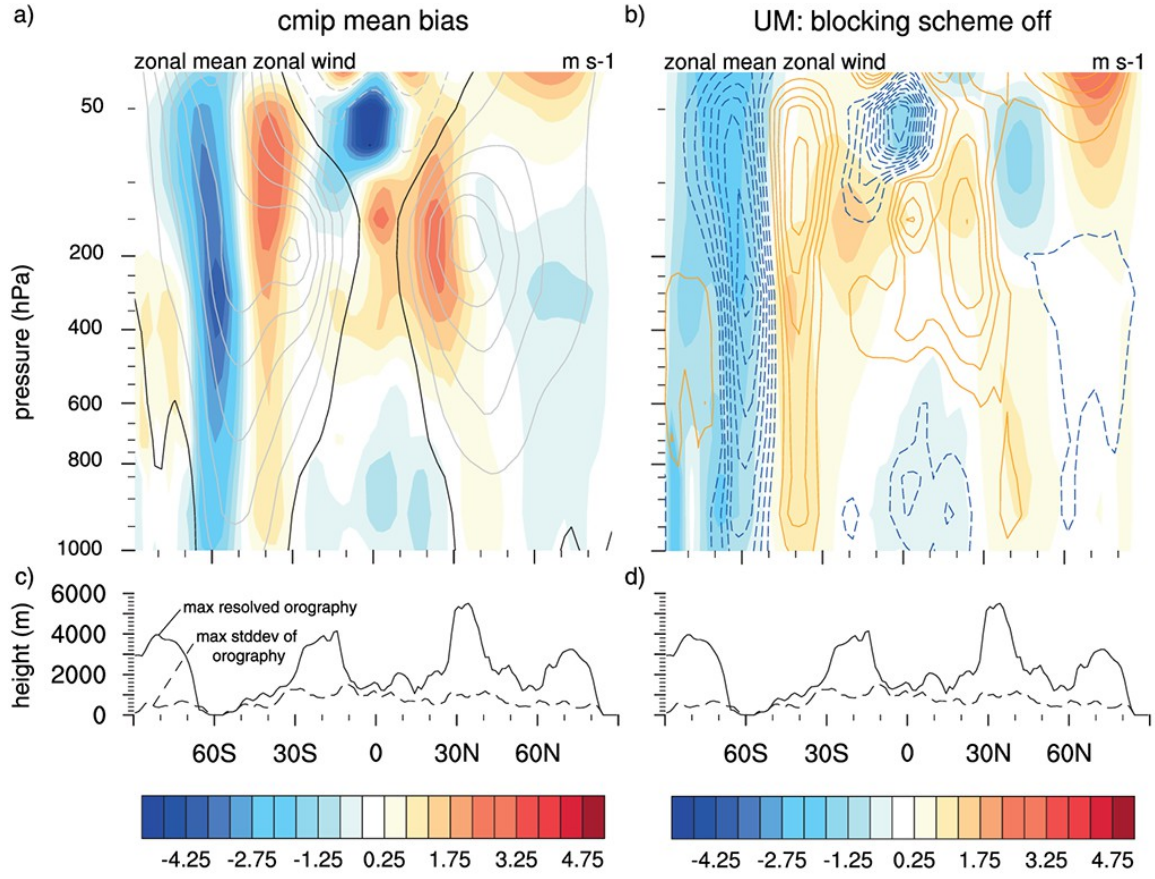
State-of-the art climate models generally struggle to represent important features of the large-scale circulation. Common model deficiencies include an equatorward bias in the location of the mid-latitude westerlies and an overly zonal orientation of the North Atlantic storm track. Orography is known to strongly affect the atmospheric circulation and is notoriously difficult to represent in coarse-resolution climate models. Yet how the representation of orography affects circulation biases in current climate models is not understood. Here, we show that the effects of switching off the parameterisation of drag from low-level orographic blocking in one climate model resemble the biases of the CMIP5 ensemble: An overly zonal wintertime North Atlantic storm track, less European blocking events, and an equatorward shift in the Southern Hemispheric jet and increase in the Southern Annular Mode timescale. This suggests that typical circulation biases in coarse-resolution climate models may be alleviated by improved parameterisations of low-level drag.



Zonal mean zonal wind biases of CMIP5 models (shading left) over zonal wind climatology (contours left), effect of switching off low-level blocking in UM climate model (shading right) over CMIP5 model biases (contours right). DOI: 10.1002/2016GL069551